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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/795,994	03/10/2004	Kazutaka Shibata	KAW 110D1	2224

7590 12/02/2005  
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EXAMINER

SANDVIK, BENJAMIN P

ART UNIT PAPER NUMBER

2826

DATE MAILED: 12/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/795,994

Applicant(s)

SHIBATA, KAZUTAKA

Examiner

Ben P. Sandvik

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 and 24-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

Applicant's arguments with respect to claims 21-23 have been considered but are moot in view of the new ground(s) of rejection.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 21 rejected under 35 U.S.C. 103(a) as being unpatentable over Dalal et al (U.S. Patent #5796591), in view of Call et al (U.S. Patent #5930597).

With respect to **claim 21**, Dalal teaches a method for manufacturing a semiconductor device in which substrate (Fig. 5, 10) and a semiconductor chip (Fig. 5, 30) are joined to each other face-to-face via bumps (Fig. 5, 20 and 38) provided on electrode terminals (Fig. 5, 18 and 48) of said first semiconductor chip or and said second semiconductor chip, comprising the steps of providing at least one of said bumps with a low-melting point metal layer having a lower melting point than that of each of said bumps (Fig. 5, 41 and Col 8 Ln 49-50), and heating up said first semiconductor chip or substrate and said second semiconductor chip to a temperature at which said low-melting point metal layer melts, to thereby join said substrate and semiconductor chip together (Fig. 6).

Dalal does not teach that the semiconductor chip and substrate are superposed without perfect alignment, that the chip and substrate are self-aligned upon heating, or that an insulating resin is filled into the gap between the chip and substrate. Call teaches that a chip and semiconductor are misaligned, and then self-align upon the heating and melting of solder bumps (Col 1 Ln 42-46), and also teaches filling an insulating resin into a gap between the chip and the substrate (Fig. 3, 16). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the bumps of Dalal self-align as taught by Call in order to compensate for the chip's misalignment, and to provide a resin underfill as taught by Call in order to strengthen the package.

Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dalal and Call, in view of Davis et al (U.S. Patent #5421507).

With respect to **claims 22 and 23**, Dalal and Call teach all of the limitations of claim 21, but do not teach liquefying said low-melting point metal layer to thereby diffuse metals of said bumps provided on the surface of said electrode terminal into the liquefied low-melting point metal, by the liquid-phase diffusion method, thus joining said substrate and said semiconductor chip to each other, or that said low-melting point layer is made of an Au-Sn alloy or Sn. Davis teaches a method in which a low-melting point layer is liquefied to thereby diffuse said metals into the liquefied low-melting point metal, by the liquid-phase diffusion method, thus joining said substrate and said semiconductor chip

together, and an interface where two Au layers are provided on copper with a layer of Sn provided between the two Au layers (Fig. 5A, 5B, 5C). It would have been obvious to one of ordinary skill in the art at the time the invention was made to join the substrate and semiconductor chip of Dalal using the liquid-phase diffusion method of Davis in order to create a high performance bond, and to select Sn as the low-melting point layer in order to take advantage of its reactive properties with Au.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben P. Sandvik whose telephone number is (571) 272-

8446. The examiner can normally be reached on Mon-Fri.

NATHAN J. FLYNN  
SUPERVISOR/PATENT EXAMINER  
TECHNOLOGY CENTER 2800

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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